

Serial No.: 10/532,364
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Remarks

The Examiner has rejected claims 2-3 and 6-10 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claiming the subject matter which applicant regards as the invention. Claim 6 is also rejected under 35 USC 101 because the claimed recitation of a use, without setting forth any steps involved in the process results in an improper definition of a process.

Claims 1-3 are rejected under 35 USC 103(a) as being unpatentable over Nobuo et al. Claims 1-2, 4-6 and 8 are rejected under 35 USC 103(a) as being unpatentable over Sander et al. and also rejected under 35 USC 103(a) as being unpatentable over Buhr et al. Claims 1-2, 5-6 and 8 are rejected under 35 USC 103(a) as being unpatentable over Roth et al. Claims 1-2, 5-6 and 8 are rejected under 35 USC 103(a) as being unpatentable over Ruckert et al.

Claims 1, 2, 6-10 have been amended. Claim 5 has been canceled and Claims 11-12 are new.

Claim 1 now relates to a chemically amplified positive-working photosensitive resin composition, comprising (A) an alkali soluble novolak resin, (B) an alkali soluble acrylic resin, (C) an acetal compound, and (D) an acid generator further where the weight ratio of the components (A):(B):(C):(D) is 100 : (2 to 200) : (1 to 50) : (0.05 to 10).

The comparative example 10 in the present invention which uses only the novolak resin as the alkali soluble resin, shows clearly that when the unique combination of the novolak resin and the acrylic resin is not present then the photoresist pattern droops. Thus the combination of the novolak and the acrylic

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resin exhibits unique properties which unexpectedly give a pattern which does not droop. A composition (Comparative Example 10) containing the novolak as the only alkali soluble resin leads to a pattern that droops. There is a clear difference in performance from a 3 component system to a 4 component system of the present invention, and the difference is due to the specific interaction of the novolak and the acrylic resin.

Nobuo et al discloses a composition where the novolak resin and the acrylic resin may be used interchangeably, but does not disclose or teach a specific compositional ratio for the case where the novolak resin and the acrylic resin are used in combination. One of ordinary skill in the art upon reading Nobuo would learn that replacing a novolak with an acrylic resin would not change the performance dramatically, since the performance of the polymers is taught by Nobuo to be equivalent. Since the polymers are taught to be equivalent, then even mixing them would give the same result. Thus there would be no expectation that a mixture of Nobuo resins would improve the stability of the patterned photoresist image. Furthermore, there is no teaching that the instability of the patterned image can be improved by using a specific combination of the resins. In Nobuo, the acrylic resin is one of many other polymers that are considered equivalent to the novolak, but there is no teaching for the modification of the prior art to arrive at the specific and unique combination of the novolak resin and the acrylic resin over all the other possible combinations and variations. Many diverse alkali soluble resins are disclosed in Nobuo, [0011] machine translation:

"For example, novolak resin, hydrogenation novolak resin, acetone-pyrogallol resin, o-polyhydroxy styrene, m-polyhydroxy styrene, p-polyhydroxy styrene, Hydrogenation polyhydroxy styrene, a halogen, or alkylation polyhydroxy styrene, A hydroxystyrene-N-permutation maleimide copolymer, o/p-, and a m/p-hydroxystyrene copolymer, the part

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to the hydroxyl group of polyhydroxy styrene -- O-alkylation object for example, 5-30-mol % O-methylation object and O-(1-methoxy) ethylation object -- O-(1-ethoxy) ethylation object, an O-2-tetrahydropyranyl ghost, O-acylation objects, such as O-(t-butoxycarbonyl) methylation object For example, (5 - 30-mol % o-acetylation object, O-(t-butoxy) carbonylation object), etc., Although a styrene maleic anhydride copolymer, a styrene-hydroxystyrene copolymer, an alpha-methyl-styrene-hydroxystyrene copolymer, carboxyl group content acrylic resin, and its derivative can be mentioned, it is not limited to these. desirable alkali fusibility resin -- a part of o-polyhydroxy styrene, m-polyhydroxy styrene, p-polyhydroxy styrene and these copolymer, alkylation polyhydroxy styrene, and polyhydroxy styrene -- they are O-alkylation or O-acylation object, a styrene-hydroxystyrene copolymer, an alpha-methyl-styrene-hydroxystyrene copolymer, and carboxyl group content (meta) acrylic resin."

There is no teaching in Nobuo that the combination of a novolak resin and an acrylic resin would stabilize the patterned image. Furthermore, Nobuo et al also does not disclose or teach a specific compositional ratio for the novolak, acrylic resin, acetal and the acid generator, as taught in the presently amended claim 1 of the present invention. One of ordinary skill in the art could not possibly combine a novolak resin with an acrylic resin from the above list of numerous resins in Nobuo and hope to improve the stability of the resist pattern. Thus it is not prima facie obvious to combine the 4 specific components of the present invention in the ratios claimed.

Sanders et al again generally discloses phenolic types of resin,

"The phenol resins, especially the novolaks, found suitable for many positive copying compositions, also have proved very suitable and advantageous for the copying compositions according to the invention.

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These binders, especially the more highly condensed resins containing substituted phenols, e.g., cresols, as the formaldehyde-condensation partner, contribute to a pronounced differentiation between the exposed and unexposed areas of the layer during development. The novolaks may be modified in known manner, by a reaction of part of their hydroxy groups, e.g., with chloroacetic acid, isocyanates, epoxides or carboxylic acid anhydrides. Other alkali-soluble resins, such as copolymers of maleic acid anhydride and styrene, or of vinyl acetate and crotonic acid, or of methyl methacrylate and methacrylic acid, and the like, also may be used as binders."

There is no teaching in Sanders that would teach one of ordinary skill in the art to possibly combine a novolak resin with an acrylic resin from the above list of Sanders resins and hope to improve the stability of the resist pattern. The arguments presented by the applicants against Nobuo also apply against Sanders, since Sander also contains only a list of possible resins. One of ordinary skill in the art upon reading Sanders would learn that replacing a novolak with an acrylic resin would not change the performance dramatically, since the performance is taught by Sanders to be equivalent. Further, Sander does not teach the specific combination of a novolak, acrylic resin and an acetal compound with the given ratios. Thus it is not prima facie obvious to combine the 4 specific components of the present invention in the ratios claimed.

Similarly, Buhr et al, Roth et al and Ruckert et al also disclose a list of alkali soluble resins which are used as the binder resin. There is no disclosure or teaching of a specific combination of a novolak resin, and acrylic resin and an acetal compound, and more specifically at a given range of concentrations for these compounds. Thus it is not prima facie obvious to combine the 4 components of the present invention in the ratios claimed.

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None of the numerous prior art references cited exemplifies or definitely specifies a mixture of a novolak resin and an acrylic resin. Surely, if it was prima facie obvious to use a mixture with the specified ratios there would have been an exemplification in the many prior art references cited. The Examiner is using the present application in hindsight to reconstruct the present combination of components. There is no motivation in all the prior art cited by the Examiner to combine a novolak resin with specifically an acrylic resin; furthermore this combination unexpectedly solves the problem of drooping resist images, a problem not foreseen by the inventors of the prior art. Thus, the references cited by the Examiner do not make the present application prima facie obvious.

In view of the above amendments and remarks, the present application is believed to be in condition for allowance, and reconsideration of it is requested. If the Examiner disagrees, she is requested to contact the attorney for Applicants at the telephone number provided below.

Respectfully submitted,



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